

# Data Mining – Tribal Minor Source Registrations

National Oil & Gas Emission Inventory Workgroup

8/13/15

# Mining Data

- This presentation shows the types of data that could be mined from our Tribal Minor Source Registrations
- The same type of data could be mined from permit applications:
  - By Operator:
    - A calculated Total Hydrocarbon, VOC, or HAP lb/bbl
    - Speciation profiles for:
      - Storage Tank vapor stream
      - Glycol dehydrator regenerator (still vent)stream
      - Raw gas stream (to be used for fugitives, pneumatic controllers, pneumatic pumps and the fuel gas burned in tank heaters, separator heater treaters, glycol dehyd reboilers, pilot light for combustors/enclosed flares, engines)
    - Bubble point Pressure vs. Separator pressure to ascertain quality of pressurized liquid sample (a key input to determine emissions from storage tanks)

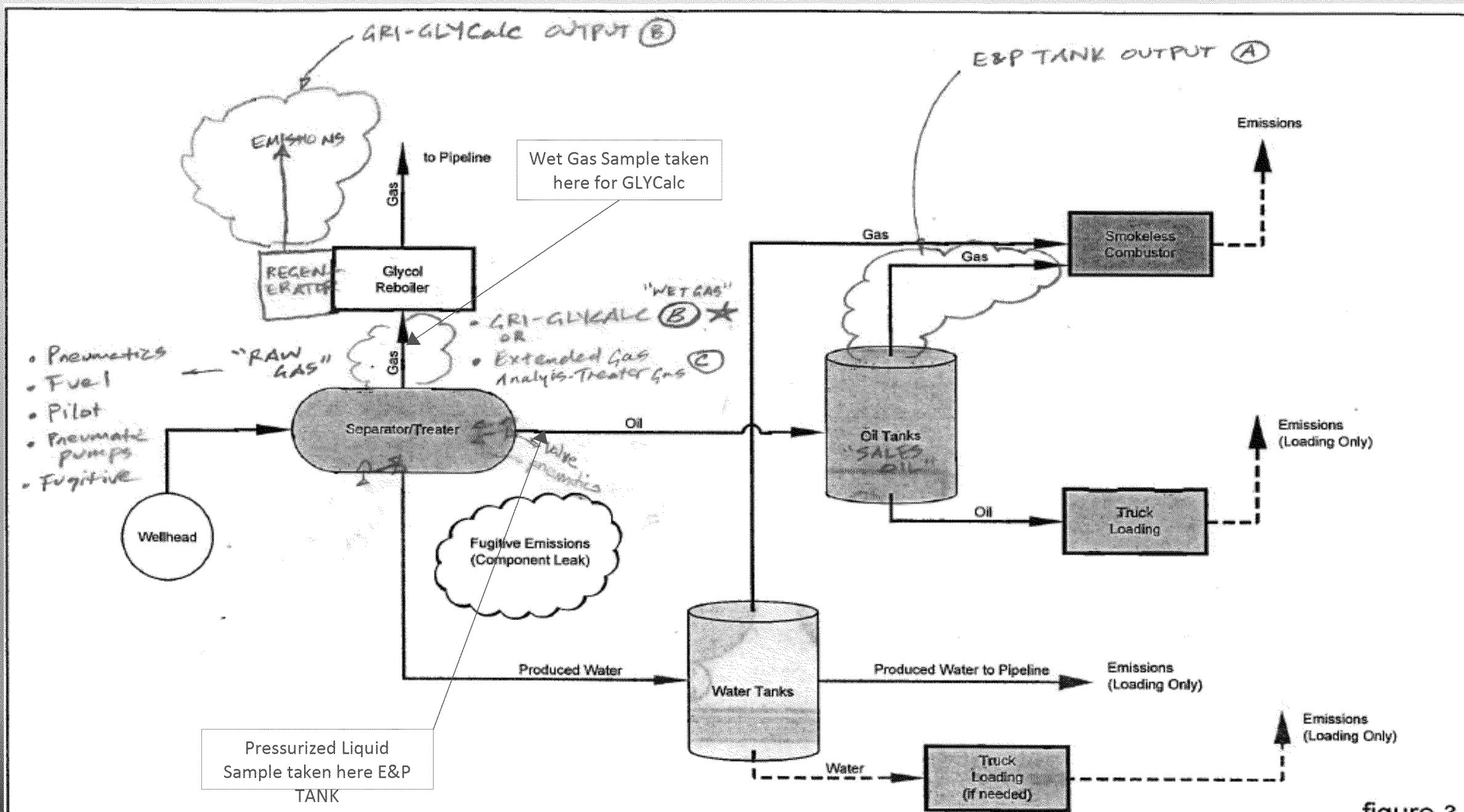


figure 2

A 1/2

\*\*\*\*\*  
\* Project Setup Information  
\*\*\*\*\*  
Project File :  
bb1s.ept  
Flowsheet Selection : Oil Tank with Separator  
Calculation Method : RVP Distillation  
Control Efficiency : 98.0%  
Known Separator Stream : Low Pressure Oil  
Entering Air Composition : No  
  
Filed Name :  
Well Name : Oil throughput of 48 bbl/day  
Date : 2013.12.03

E&P TANK Inputs

\*\*\*\*\*  
\* Data Input  
\*\*\*\*\*

Separator Pressure (psia) : 200.00 (psia) + 14.7 = psia  
Separator Temperature (°F) : 68.00 (°F)  
Ambient Pressure (psia) : 14.73 (psia)  
Ambient Temperature (°F) : 50.00 (°F)  
C10+ SG : 0.7462  
C10+ MW : 160.929

Pressurized Liquid Sample

No.	Component	mol %
1	H2S	0.0000
2	O2	0.0000
3	CO2	0.1949
4	N2	0.0000
5	C1	7.1742
6	C2	3.5664
7	C3	6.4025
8	i-C4	2.7483
9	n-C4	5.8868
10	i-C5	4.1263
11	n-C5	4.1546
12	C6	4.0860
13	C7	17.4383
14	C8	7.8048
15	C9	6.0047
16	C10+	19.6945
17	Benzene	0.4825
18	Toluene	2.1265
19	E-Benzene	0.2603
20	Xylenes	3.6355
21	n-C6	3.5804
22	224Trimethylp	0.5323

Pressurized Liquid  
Sample

Add Parameter  
Yes/No Box  
Oil/Gas  
Tanks  
Controlled = Y

--- Sales Oil ---  
Production Rate (bopd) : 48 (bbl/day)  
Days of Annual Operation : 365 (days/year)  
API Gravity Sales Oil : 53.0  
Sales Vapor Pressure : 9.00 (psia)  
RVP Sales Oil (psia)

E&P TANK Outputs

\*\*\*\*\*  
\* Calculation Results  
\*\*\*\*\*

Item	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
Total H2S (ppm)	0.420	1.840	0.037	0.008
Page 1				E&P TANK
Total HC (ppm)	176.829	40.372	3.537	0.807
VOCs, C2+	147.363	33.645	2.947	0.673
VOCs, C3+ (ppm)	119.932	27.382	2.399	0.548

# E&P Tanks

A 2/2

Vapor (MW) : 10.4100 (MUSCFD)  
HC Vapor : 10.5100 (MUSCFD)  
GCR (SCF/bbl) : 221.04 (SCF/bbl)

No	Component	Uncontrolled [ton/yr]	Uncontrolled [lb/hr]	Controlled [ton/yr]	Controlled [lb/hr]
1	H2S	0.0000	0.0000	0.0000	0.0000
2	O2	0.0000	0.0000	0.0000	0.0000
3	CO2	2.195	0.501	2.196	0.501
4	N2	0.0000	0.0000	0.0000	0.0000
5	C1	29.465	6.727	0.389	0.135
6	C2	27.431	6.263	0.549	0.125
7	C3	61.315	13.999	1.226	0.280
8	i-C4	15.361	3.507	0.307	0.070
9	n-C4	22.927	5.234	0.659	0.105
10	i-C5	7.505	1.713	0.150	0.034
11	n-C5	5.691	1.299	0.114	0.026
12	C6	1.927	0.440	0.039	0.009
13	C7	2.818	0.643	0.056	0.013
14	C8	0.381	0.089	0.008	0.002
15	C9	0.107	0.024	0.002	0.000
16	C10+	0.046	0.011	0.001	0.000
17	Benzene	0.151	0.034	0.003	0.001
18	Toluene	0.203	0.046	0.004	0.001
19	E-Benzene	0.008	0.002	0.000	0.000
20	Xylenes	0.035	0.002	0.002	0.000
21	n-C6	1.307	0.298	0.026	0.006
22	224Trimethylp	0.080	0.018	0.002	0.000
	Total	179.024	40.873	3.580	0.817

No.	Component	MW	Flash Oil	Sale Oil	Flash Gas	W&S Gas	Total
1	H2S	34.80	0.0000	0.0000	0.0000	0.0000	0.0000
2	O2	32.00	0.0000	0.0000	0.0000	0.0000	0.0000
3	CO2	44.01	0.1949	0.0248	0.0000	1.1174	0.9767
4	N2	28.01	0.0000	0.0000	0.0000	0.0000	0.0000
5	C1	16.04	7.1742	0.2903	0.0000	44.3351	35.9527
6	C2	30.07	3.5664	0.8414	0.0038	18.2764	17.8572
7	C3	44.10	6.4025	3.8421	1.2132	20.2233	52.4956
8	i-C4	58.12	2.7483	2.4369	2.1438	4.4292	5.1733
9	n-C4	58.12	5.8868	5.6983	5.4295	6.9043	10.6740
10	i-C5	72.15	4.1263	4.5403	4.6474	1.8916	2.0361
11	n-C5	72.15	4.1546	4.8956	5.0552	1.4343	1.5441
12	C6	86.16	4.0860	4.7662	4.9926	0.4143	0.4491
13	C7	100.20	17.4383	20.5729	21.6438	0.5174	0.5687
14	C8	114.23	7.8048	9.0021	9.4834	0.0618	0.0953
15	C9	128.28	6.0047	7.1143	7.4974	0.0147	0.0256
16	C10+	160.93	19.6945	23.3420	24.6028	0.0047	0.0089
17	Benzene	78.11	0.4825	0.5654	0.5933	0.0340	0.0492
18	Toluene	92.13	2.2265	2.6318	2.7708	0.0380	0.0430
19	E-Benzene	106.17	0.2603	0.3083	0.3248	0.0013	0.0015
20	Xylenes	106.17	3.6355	4.3061	4.5374	0.0155	0.0175
21	n-C6	86.18	3.5804	4.1932	4.3990	0.2726	0.2968
22	224Trimethylp	114.24	0.5323	0.6286	0.6616	0.0125	0.0137
MW			94.41	105.92	109.21	32.28	45.04
Stream Mole Ratio			1.0000	0.8437	0.8005	0.1563	0.1995
Heating Value	[BTD/SCF]					1852.84	2553.22
Gas Gravity	[Gas/Air]					1.11	1.55
Bubble Pt. @ 100F	[psia]		262.49	28.71	9.88		
RVP @ 100F	[psia]		69.66	17.26	8.99		
Page 2							E&P TANK
Spec. Gravity @ 100F			0.659	0.676	0.680		

# GOR Data

## FLASH LIBERATION OF HYDROCARBON LIQUID FROM GMBU OIL STORAGE TANKS

GREATER MB UNIT

OILTK-1

GOR from analysis	7.76	scf/bbl
Throughput (bbbls/yr)	14,262	bbbls/yr
Throughput (bbbls/day)	39.07	bbbls/day
Gas Flash Rate (SCFD):	303	scfd
Gas Flash Rate (lbs./day):	30.252	lb/day
$\text{Lb./Day} = \text{gas (ft}^3\text{/day)} \times (\text{Mw}_{\text{gas}} - \text{lb/lb-mole}) / (379.49 \text{ ft}^3\text{/lb-mole})$		

Component	Mole percent	Component Molecular Wt.	Mole Frac x Mole Stream MW	Weight Percent	Weight Fraction	Uncontrolled Emissions, (lb/day)	Uncontrolled Emissions, (tpy)
Hydrogen Sulfide	0.000%	34.080	0.000	0.000%	0.000	0.00E+00	0.00E+00
Nitrogen	0.576%	28.013	0.161	0.426%	0.004	1.29E-01	2.35E-02
Carbon Dioxide	0.522%	44.010	0.230	0.609%	0.006	1.84E-01	3.36E-02
Methane	39.687%	16.043	6.367	16.821%	0.168	5.09E+00	9.29E-01
Ethane	15.967%	30.070	4.801	12.685%	0.127	3.84E+00	7.00E-01
Propane	16.004%	44.097	7.057	18.645%	0.186	5.64E+00	1.03E+00
Iso-Butane	3.577%	58.123	2.079	5.493%	0.055	1.66E+00	3.08E-01
n-Butane	8.759%	58.123	5.091	13.450%	0.135	4.07E+00	7.48E-01
2,2 Dimethylpropane	0.024%	72.140	0.017	0.046%	0.000	1.40E-02	2.55E-03
Iso-Pentane	3.354%	72.150	2.420	6.393%	0.064	1.93E+00	3.53E-01
n-Pentane	4.381%	72.150	3.161	8.351%	0.084	2.53E+00	4.61E-01
2,2 Dimethylbutane	0.033%	86.178	0.029	0.076%	0.001	2.28E-02	4.17E-03
Cyclopentane	0.396%	70.100	0.277	0.732%	0.007	2.22E-01	4.04E-02
2,3 Dimethylbutane	0.030%	86.178	0.026	0.069%	0.001	2.10E-02	3.82E-03
2 Methylpentane	1.187%	86.178	1.023	2.702%	0.027	8.17E-01	1.49E-01
3 Methylpentane	0.497%	86.178	0.428	1.130%	0.011	3.42E-01	6.24E-02
n-Hexane	1.671%	86.178	1.440	3.805%	0.038	1.15E+00	2.10E-01
Methylcyclopentane	0.553%	84.160	0.465	1.279%	0.012	3.72E-01	6.78E-02
Benzene	0.131%	78.114	0.102	0.271%	0.003	8.19E-02	1.49E-02
Cyclohexane	0.406%	84.160	0.341	0.902%	0.009	2.73E-01	4.98E-02
2-Methylhexane	0.162%	100.200	0.163	0.430%	0.004	1.30E-01	2.37E-02
3-Methylhexane	0.183%	100.200	0.184	0.485%	0.005	1.47E-01	2.68E-02
2,2,4 Trimethylpentane	0.047%	114.230	0.054	0.142%	0.001	4.30E-02	7.84E-03

# GOR Data

## FLASH LIBERATION OF HYDROCARBON LIQUID FROM GMBU OIL STORAGE TANKS

Newfield GMBU M-11-9-17 & GMBU L-11-9-17

GREATER MB UNIT

OILTK-1

GOR from analysis	7.76	scf/bbl
Throughput (bbls/yr)	14,262	bbls/yr
Throughput (bbls/day)	39.07	bbls/day
Gas Flash Rate (SCFD):	303	scfd
Gas Flash Rate (lbs./day):	30.252	lb/day
Lb./Day = gas (ft <sup>3</sup> /day)x(Mwgas - lb/lb-mole) / (379.49 ft <sup>3</sup> /lb-mole)		

Component	Mole percent	Component Molecular Wt.	Mole Frac x Mole Stream MW	Weight Percent	Weight Fraction	Uncontrolled Emissions, (lb/day)	Uncontrolled Emissions, (tpy)
Other C7's	0.410%	100.272	0.411	1.085%	0.011	3.28E-01	5.99E-02
n-Heptane	0.495%	100.272	0.496	1.310%	0.013	3.96E-01	7.23E-02
Methylcyclohexane	0.346%	98.190	0.340	0.898%	0.009	2.72E-01	4.96E-02
Toluene	0.098%	92.140	0.090	0.239%	0.002	7.23E-02	1.32E-02
Other C8's	0.302%	114.230	0.345	0.911%	0.009	2.76E-01	5.03E-02
n-Octane	0.057%	114.230	0.065	0.171%	0.002	5.17E-02	9.43E-03
Ethylbenzene	0.004%	106.170	0.005	0.012%	0.000	3.68E-03	6.71E-04
M&P Xylenes	0.026%	106.170	0.028	0.073%	0.001	2.20E-02	4.01E-03
O-Xylenes	0.005%	106.170	0.005	0.013%	0.000	3.82E-03	6.97E-04
Other C9's	0.055%	128.258	0.071	0.187%	0.002	5.66E-02	1.03E-02
n-Nonane	0.009%	128.258	0.012	0.032%	0.000	9.57E-03	1.75E-03
Other C10's	0.018%	142.280	0.026	0.069%	0.001	2.09E-02	3.82E-03
n-Decane	0.005%	142.280	0.007	0.018%	0.000	5.40E-03	9.86E-04
Undecanes+	0.022%	156.310	0.034	0.089%	0.001	2.69E-02	4.90E-03
Total	100.000%	Mole wt.	37.851	100.000%			
Total:						3.03E+01	5.52E+00

VOC INFO	
Mole % VOCs	43.25%
Total NM/NE Stream MW VOCs	26.290
lb Voc / mmscf	69278.432
MMSCF/YR	0.111

	Uncontrolled Emissions, (lb/day)	Uncontrolled Emissions, (tpy)
Total VOC:	2.10E+01	3.83E+00
Total Me/Eth	8.93E+00	1.63E+00

# AP-42 Data

## AP-42 TANK WORKING and BREATHING EMISSIONS OILTK-1

INPUT DATA			
	Symbol		Units
<b>Molecular Weight</b>			
Molecular weight	Mv	50	Lb/lb-mole
<b>Tank design data</b>			
Shell height	Hs	20.00	ft
Diameter	D	12.00	ft
Liquid height	HL	20.00	ft
Avg. Liquid height	HL	10.00	ft
vapor space outage	Hvo	10.00	ft
Tank volume		18.921	gallons
Turnovers	N	35	
Net throughput	Q	14262.00	bbl/yr
Turnover factor	KN	1.000	
Working loss product factor	Kp	0.75	
<b>Meteorological data</b>			
Daily ave. ambient temp.	TAA	51.9625	°F
Daily max. ambient temp.	TAX	63.641667	°F
Daily min. ambient temp.	TAN	40.283333	°F
Daily ambient temp. range	DTA	23.36	°F
Tank paint solar absorptance (see adjacent table)	α	0.68	
Daily total insolation factor	I	1,452.11835	Btu/ft2-day
Site elevation (feet)		4,162	
Atmospheric pressure	PA	12.614	
Liquid bulk temperature	TB	55.04	°F
Daily vapor temp. range	DTv	44.47	°F
Daily ave. liquid surface temp.	TLA	61.49	°F
Daily max. liquid surface temp.	TLX	72.60	°F
Daily min. liquid surface temp.	TIN	50.37	°F
VP @ daily ave. liquid surf. temp.	PvA	154.83	mm Hg
VP @ daily max. liquid surf. temp.	PvX	190.48	mm Hg
VP @ daily min. liquid surf. temp.	PvN	123.42	mm Hg
Daily vapor pressure range	DPv	67.04	mm Hg
Breather vent pressure setting range	DPB	0.55	psia
Breather vent pressure setting range	DPB	3.10	mm Hg
CALCULATIONS			
	Symbol		Units
<b>Breathing losses</b>			
Tank vapor space volume	Vv	1,130.98	ft3
Vapor density	Wv	2.881E-02	lb/ft3
Vapor space expansion factor	KE	0.21319	
Vented vapor saturation factor	Ks	0.3878	ft2
<b>Breathing losses</b>	LB	908.24	lb/yr
<b>Working losses</b>	Lw	1,552.92	lb/yr
<b>TOTAL LOSSES</b>	LT	0.29	lb/hr
		2,501.16	lb/yr
		1.25E+00	tpv

Calculations performed on this spreadsheet are taken from the USEPA AP-42- Section 7.1  
Organic Liquid Storage Tanks - November 2006.

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GRI-GLYCalc VERSION 4.0 - SUMMARY OF INPUT VALUES

Case Name:  
File Name:  
Date: December 04, 2013

DESCRIPTION:

Description:  
Annual Hours of Operation: 8760.0 hours/yr

WET GAS:

Temperature: 85.00 deg. F  
Pressure: 180.00 psig  
Wet Gas Water Content: Saturated

Component	Conc. (vol %)
Carbon Dioxide	0.2374
Nitrogen	0.3068
Methane	89.1437
Ethane	6.0090
Propane	1.8835
Isobutane	0.4852
n-Butane	0.5918
Isopentane	0.2967
n-Pentane	0.2391
n-Hexane	0.1295
Cyclohexane	0.0624
Other Hexanes	0.1840
Heptanes	0.1667
Methylcyclohexane	0.1028
2,2,4-Trimethylpentane	0.0100
Benzene	0.0232
Toluene	0.0187
Ethylbenzene	0.0007
Xylenes	0.0039
C8+ Heavies	0.0989

★ = "RAW GAS" Composition  
C/o used for  
- Pneumatic Devices  
- Controllers  
- Pumps  
- Fugitive Emissions  
- Fuel Gas

DRY GAS:

Flow Rate: 0.6 MMSCF/day  
Water Content: 7.0 lbs. H2O/MMSCF

LEAN GLYCOL:

Glycol Type: TBG  
Water Content: 1.5 wt% H2O  
Recirculation Ratio: 3.0 gal/lb H2O

PUMP:

Glycol Pump Type: Electric/Pneumatic

GLYCalc Inputs

# GlyCalc

GLYCalc Outputs

B 2/2

GRI-GLYCalc VERSION 4.0 - EMISSIONS SUMMARY

Case Name: I  
File Name: C...  
Date: December 04, 2013

UNCONTROLLED REGENERATOR EMISSIONS

Component	lbs/hr	lbs/day	tons/yr
Methane	0.0692	1.661	0.3032
Ethane	0.0345	0.828	0.1511
Propane	0.0356	0.854	0.1559
Isobutane	0.0199	0.477	0.0870
n-Butane	0.0333	0.798	0.1457
Isopentane	0.0252	0.604	0.1103
n-Pentane	0.0264	0.633	0.1155
n-Hexane	0.0338	0.812	0.1462
Cyclohexane	0.0659	1.582	0.2886
Other Hexanes	0.0352	0.845	0.1543
Heptanes	0.1137	2.729	0.4980
Methylcyclohexane	0.1708	4.098	0.7480
2,2,4-Trimethylpentane	0.0036	0.087	0.0159
Benzene	0.1923	4.616	0.8424
Toluene	0.2978	7.147	1.3043
Ethylbenzene	0.0207	0.498	0.0909
Xylenes	0.3784	9.082	1.6574
C8+ Heavies	0.8391	20.139	3.6754
Total Emissions (M)	2.3954	57.490	10.4919
Total Hydrocarbon Emissions	2.3954	57.490	10.4919
Total VOC Emissions (M)	2.2917	55.001	10.0376
Total HAP Emissions (M)	0.9267	22.241	4.0590
Total BTEX Emissions	0.8892	21.342	3.8949

FLASH TANK EMISSIONS

# Treater Gas Analysis aka "raw gas"

SUMMARY- EXTENDED GAS ANALYSIS- TREATER GAS

i.e. Gas off of Separator  
"RAW" Gas

Component	Wt%	Corrected Wt%	Mol%
Methane	84.08	83.60	92.9003
Ethane	6.71	6.68	3.9582
Propane	3.00	2.98	1.2067
Isobutane	0.86	0.85	0.2619
n-Butane	1.09	1.08	0.3314
Neopentane	0.03	0.03	0.0074
Isopentane	0.55	0.55	0.1354
n-Pentane	0.47	0.47	0.1165
2,2-Dimethylbutane	0.04	0.04	0.0075
2,3-Dimethylbutane	0.06	0.06	0.0122
2-Methylpentane	0.18	0.18	0.0373
3-Methylpentane	0.11	0.11	0.0218
n-Hexane	0.27	0.27	0.0556
Heptanes	0.91	0.90	0.1703
Octanes	0.14	0.14	0.0212
Nonanes	0.09	0.09	0.0128
Decanes plus	0.03	0.03	0.0037
Nitrogen	0.78	0.78	0.4939
Carbon Dioxide	0.61	0.61	0.2459
Oxygen	0.00	0.00	0
Hydrogen Sulfide	0.00	0.00	0
Benzene	0.06	0.06	0.0146
Toluene	0.05	0.05	0.0099
Ethylbenzene	0.00	0.002	0.0003
M&P Xylene	0.02	0.024	0.004
O-Xylene	0.00	0.00	0.0005
2,2,4-Trimethylpentane	0.02	0.02	0.0035
Cyclopentane	0.00	0.00	0
Cyclohexane	0.15	0.153	0.0323
Methylcyclohexane	0.25	0.25	0.0452

Total 100.57 100.00 100.11

VOC Wt% 8.34

HAPs	Wt%
Benzene	0.06
Toluene	0.05
Ethylbenzene	0.002
Xylenes	0.027
2,2,4-Trimethylpentane	0.02
n-Hexane	0.27

Aggregate HAP Wt % 0.44

HAP Speciation	Wt%	Corrected Wt %
Benzene	0.06	14.73
Toluene	0.05	11.69
Ethylbenzene	0.00	0.46
Xylenes	0.03	6.17
2,2,4-Trimethylpentane	0.02	5.19
n-hexane	0.27	61.76

Aggregate HAP Wt % 0.44 100.00

Avg Molecular Weight	17.73	gm/mole
Gross Btu/real CF	1091.20	BTU/SCF at 60°F and 14.73 psia
Specific Gravity	0.61	

How to  
define common  
component list

Could be used for speciation of emissions from:

- Fugitives
- Pneumatic controllers
- Pneumatic pumps
- Fuel gas for:
  - Heater treaters
  - Tank heaters
  - Glycol reboilers
  - Pump engines
  - Combustor pilot

# Summary – Uintah & Ouray Indian Reservation

- 19 Operators, 5243 Facilities, 5265 Registrations
- Registrations do not include US Well IDs or start up date (data gap)
- 268 out of 5243 facilities have emission controls on storage tanks
- Ambient pressures used 11.2 – 15.5 (psia)
- Ambient temperatures used 12.3 – 160 (°F)

# Tank Data (E&P Tanks & GOR)

Weighted Average VOC lb/bbl =

10.6

Operator	# of Registration	Separator T (°F)	Separator P (psig)	API Gravity Sales Oil AVG	VOC lb/bbl AVG	VOC lb/bbl Std. Deviation	bbl/yr=6 TPY VOC
A	37	82	57	62.0	6.5	0.0	1,839
B	34	160	30-38	40.9	1.0	0.2	11,504
C	1966	74-75	108-138	52.0	5.9	1.8	2,044
D	32	60-99	200-380	51.4	1.1	0.0	11,344
F	59	100-168	30-85	39.6	1.3	0.5	9,239
G	1	70	64	32.0	0.6	0.0	20,492
H	734	40-157	17-330	50.8	46.0	24.6	261
H	6	50-72	110-135	65.4	8.8	15.0	1,357
I	8	50-157	80-600	50.1	5.4	5.3	2,221
J	35	100-108	52-700	47.4	4.2	6.2	2,849
K	566	40-80	25-190	44.1	0.3	0.1	46,256
L	1274	45-90	200-325	63.7	7.2	1.7	1,658
M	83	158	40	34.4	1.1	0.0	10,667
N	44	N/A	N/A		N/A	N/A	N/A
O	86	64-163	60-70	30.1	0.4	0.0	28,455
P	9	80	65	57.0	4.6	3.9	2,620
Q	261	N/A	N/A		1.0	1.7	11,827
R	6	48	90	54.6	8.2	0.0	1,468
S	18	N/A	AVG		2.2	0.0	5,476

# Normalized Pressurized Liquid Sample Speciation Profile – (mol %) E&P TANKS

Operator	A	C	D	F	G	H	I	J	K	L	O	P	R
H2S	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
O2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
CO2	0.08	0.19	0.03	0.01	0.17	0.24	0.15	0.05	0.02	0.23	0.14	0.01	0.10
N2	0.01	0.00	0.00	0.01	0.02	0.02	0.00	0.01	0.01	0.00	0.02	0.00	0.01
C1	1.40	6.46	2.32	0.38	3.13	7.06	6.38	2.66	1.16	9.74	2.64	0.15	3.70
C2	1.77	2.21	1.09	0.25	0.70	2.56	2.96	1.73	0.71	6.09	0.60	0.57	1.70
C3	4.82	2.83	1.37	0.43	1.07	4.33	2.99	2.75	1.11	9.14	0.95	2.41	4.39
i-C4	2.82	1.35	0.67	0.22	0.88	2.08	1.00	1.64	0.54	3.61	0.77	1.73	2.26
n-C4	5.97	2.73	1.27	0.59	1.11	4.29	2.48	2.38	1.11	6.86	1.05	3.55	5.12
i-C5	4.31	2.46	1.33	0.44	1.05	3.56	1.46	3.23	1.02	4.13	0.97	4.14	4.08
n-C5	4.19	2.57	1.82	0.93	1.00	3.72	2.27	2.82	1.18	4.33	0.94	3.86	4.51
C6	6.51	3.45	16.77	12.29	1.53	4.73	4.43	3.24	0.31	4.11	4.02	6.51	5.41
C7	17.75	19.21	28.81	16.74	4.43	20.09	12.70	9.01	7.80	16.00	5.85	18.71	18.41
C8	18.64	12.48	12.54	12.50	5.89	8.92	7.84	11.44	15.88	6.07	7.26	19.43	16.39
C9	7.44	8.65	6.06	10.48	4.22	5.97	5.10	5.60	8.53	4.08	5.60	6.84	5.90
C10+	11.61	20.24	5.72	28.75	72.44	20.80	38.71	46.28	50.03	14.97	65.47	15.52	16.99
Benzene	0.56	0.88	2.43	1.56	0.31	0.83	1.02	0.36	0.37	0.57	0.39	1.18	1.34
Toluene	3.28	3.92	6.08	2.74	0.38	2.76	3.25	1.96	3.62	2.57	0.66	5.21	2.57
E-Benzene	0.26	0.39	0.30	0.38	0.05	0.34	0.30	0.19	0.43	0.27	0.07	0.46	0.21
Xylenes	3.41	5.43	3.69	2.29	0.50	3.20	3.37	2.45	5.27	3.31	0.63	4.86	1.51
n-C6	5.17	3.24	7.03	7.97	1.12	3.87	2.89	2.19	0.87	3.35	1.89	4.86	5.36
224Trimethylp	0.00	1.30	0.67	1.03	0.00	0.63	0.69	0.00	0.04	0.54	0.10	0.00	0.00
API Sales Oil	62.0	52.0	51.4	39.6	32.0	50.8	50.1	47.4	44.1	63.7	30.1	57.0	54.6

**TOG Condensate Tank Emission Profiles: values reported in weight %**

Species	A	C	D	H	I	J	K	L	P	R
Methane	6.2997	26.4868	42.5441	13.0250	15.2277	18.8200	41.5324	15.5540	0.7173	12.5141
Ethane	11.2580	18.1956	18.1926	12.6239	24.9393	21.8901	21.2591	17.2700	5.1086	10.7620
Propane	26.8229	19.0308	11.9138	26.0258	31.2682	32.9904	17.4148	34.5372	30.5980	36.3504
Propylene	-	-	-	-	-	-	-	-	-	-
Isobutane (or 2-Methylpropane)	11.6633	7.7761	3.0643	9.8883	5.0718	7.8964	4.3806	9.8265	18.0008	10.1963
N-butane	18.6914	11.8718	4.0404	13.5358	11.7698	9.1849	6.2354	13.2771	22.4188	14.9828
Isopentane (or 2-Methylbutane)	7.4490	4.7392	1.9953	7.4246	3.1223	3.7800	2.6155	3.6517	7.8238	5.0941
N-pentane	5.4619	3.7033	1.9751	5.5026	3.8963	2.4515	2.1749	2.7245	4.9544	4.0176
N-hexane	2.3255	1.3176	2.3995	4.0770	0.7668	0.4988	0.4274	0.5787	1.4481	1.2907
Isomers of pentane	-	-	-	-	-	-	-	-	-	-
Isomers of hexane	3.6207	1.8203	7.2618	1.2800	1.1982	0.9608	0.1958	0.9225	3.1309	1.6971
Isomers of heptane	3.8975	2.8853	4.5450	4.6626	1.6431	0.8830	1.6757	1.2016	3.4996	2.0047
Isomers of octane	1.5184	1.0730	0.6245	0.5906	0.3199	0.3168	1.1290	0.1425	1.3677	0.5657
Benzene	0.2076	0.2431	0.6298	0.5383	0.2493	0.1042	0.1344	0.0844	0.2276	0.2581
Toluene	0.3921	0.2763	0.5517	0.3972	0.2422	0.1524	0.4307	0.1068	0.3364	0.1565
Ethylbenzene	0.0231	0.0061	0.0040	0.0127	0.0091	-	0.0011	0.0038	0.0161	0.0000
Cumene	-	-	-	-	-	-	-	-	-	-
trimethylbenzene	-	-	-	-	-	-	-	-	-	-
M, O, & p-xylene	0.1384	0.1494	0.0444	0.1057	0.0881	0.0187	0.1602	0.0388	0.1218	0.0549
2,2,4-trimethylpentane	-	0.2	0.0	0.1	0.1	-	0.0	0.0374	0.0	-
C7	-	-	-	-	-	-	-	-	-	-
C8	-	-	-	-	-	-	-	-	-	-
C9	0.2306	0.2473	0.1583	0.1167	0.0661	0.0508	0.2268	0.0327	0.2078	0.0549
C10+	0.0000	0.0264	0.0081	0.0460	0.0071	0.0010	0.0056	0.0098	0.0201	0.0000
C-5 Cycloparaffins	-	-	-	-	-	-	-	-	-	-
C-6 Cycloparaffins	-	-	-	-	-	-	-	-	-	-
C-7 Cycloparaffins	-	-	-	-	-	-	-	-	-	-
C-8 Cycloparaffins	-	-	-	-	-	-	-	-	-	-
Unidentified	-	-	-	-	-	-	-	-	-	-
Total	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000
Total M,E	17.558	44.682	60.737	25.649	40.167	40.710	62.792	32.824	5.826	23.276
API Gravity Sales Oil	62.0	52.0	51.4	50.7	50.1	47.4	44.1	63.7	57.0	54.6

TOG Oil Tank Emission Profiles: values reported in weight %			
Species	F	G	O
Methane	6.6536	38.9561	43.0950
Ethane	5.1882	15.3404	13.0040
Propane	6.8041	17.0285	15.1236
Propylene			
Isobutane (or 2-Methylpropane)	2.5083	8.7806	7.6546
N-butane	5.2310	8.2504	7.3244
Isopentane (or 2-Methylbutane)	2.4480	3.9064	3.2775
N-pentane	3.5651	2.8085	2.3326
N-hexane	13.9475	0.8053	1.1838
Isomers of pentane			
Isomers of hexane	22.2600	1.3730	3.3331
Isomers of heptane	16.9461	1.5205	1.9171
Isomers of octane	5.5348	0.7228	0.8322
Benzene	2.5466	0.1951	0.2032
Toluene	1.7094	0.0775	0.2757
Ethylbenzene	0.0899	0.0050	0.0057
Cumene			
trimethylbenzene			
M, O, & p-xylene	0.6178	0.0325	0.0392
2,2,4-trimethylpentane	1.0701	0.0000	0.0449
C7			
C8			
C9	2.2552	0.1976	0.2850
C10+	0.6241	0.0000	0.0684
C-5 Cycloparaffins			
C-6 Cycloparaffins			
C-7 Cycloparaffins			
C-8 Cycloparaffins			
Unidentified			
Total	100.000	100.000	100.000
Total M,E	11.8418	54.2965	56.0990
API Gravity Sales Oil	39.6	32.0	30.1

← Flash + W/S/B  
from E&P TANKS

Flash from  
GOR→

TOG Oil Tank Emission Profiles: values reported in mol%			
Species	M	B	Q
H2S	0.00	0.00	0.00
N	1.46	0.64	0.57
CO2	0.60	0.12	0.53
C1	30.92	9.45	39.11
C2	18.23	14.34	16.32
C3	23.34	19.62	16.16
i-C4	4.69	5.13	3.57
n-C4	10.70	15.61	8.76
2,2-Dimethylpropane	0.00	0.05	0.03
i-C5	3.41	6.80	3.31
n-C5	4.07	10.72	4.39
2,2-Dimethylbutane	0.00	0.22	0.04
Cyclopentane	0.00	0.32	0.37
2,3-Dimethylbutane	0.00	0.43	0.05
2 Methylpentane	0.00	2.43	1.16
3 Methylpentane	0.00	1.35	0.50
n-Hexane	1.17	5.88	1.75
Methylcyclopentane	0.00	0.74	0.53
Benzene	0.07	0.36	0.13
Cyclohexane	0.00	0.81	0.40
2-Methylhexane	0.00	0.53	0.17
3-Methylhexane	0.00	0.48	0.18
2,2,4-Trimethylpentane	0.00	0.00	0.04
n-Heptane	0.00	1.73	0.53
Methylcyclohexane	0.00	0.67	0.36
Toluene	0.05	0.23	0.10
Other C8's	0.24	0.41	0.31
n-Octane	0.00	0.20	0.07
Ethylbenzene	0.00	0.00	0.00
M&P Xylenes	0.01	0.02	0.03
O-Xylenes	0.00	0.00	0.01
Other C9's	0.05	0.03	0.06
n-Nonane	0.00	0.01	0.01
Other C10's	0.01	0.00	0.02
n-Decane	0.00	0.00	0.01
Undecanes+	0.00	0.00	0.02
API Sales Oil	34.4	40.9	

DRAFT

# Bubble Point Pressure vs. Separator P E&P TANKS

- A way to ascertain quality of pressurized liquid sample and/or analysis of that sample
- Bubble Point is an Output of E&P TANK:

MW	94.41
Stream Mole Ratio	1.0000
Heating Value	[BTU/SCF]
Gas Gravity	[Gas/Air]
Bubble Pt. @ 100F	[psia] 262.48
RVP @ 100F	[psia] 69.66
Page 2	
Spec. Gravity @ 100F	0.659

- If Separator Temp < 100 F would expect Sep P < calculated Bubble Point Pressure. If Sep. T > 100 F would expect Sep P > calculated Bubble Point Pressure.
- Uncertainty in the equation of state used to determine the bubble point is at least  $\pm 5\%$  and the uncertainty in the fluid analysis used in the calculation will be at least  $\pm 5\%$ .

Bubble Point > Separator Pressure ... separator pressure is less than expected.

This could occur due to one or more of the following:

- The pressure gauge on the separator is in error and is reading low.
- The temperature reading on the separator is in error and is reading high.
- The collected liquid sample contained some entrained gas when it was sampled and this entrained gas was driven into solution with the liquid at the time of analysis indicating a more volatile liquid than actually exists.

Bubble Point < Separator Pressure ... separator pressure is greater than expected.

This could occur due to one or more of the following:

- The pressure gauge on the separator is in error and is reading high.
- The temperature reading on the separator is in error and is reading low.
- Some of the flash gas from the liquid sample was lost during handling or analysis.
- Some foaming occurred during collection of the sample and the resulting gas phase was not driven back into solution with the liquid phase before being analyzed.
- The sample temperature at the lab at the time of analysis is greater than the original separator temperature resulting in the formation of a gas phase in the sample container.

# Bubble Point vs. Separator P, cont'd E&P TANKS

Operator	Separator T (°F)	Separator P (psig)	Bubble Point P @ 100 F (psig)	% Difference
A	82	57	73	28%
C	74-75	108-138	135	-2% to +25%
D	60-99	200-380	82	-78% to -60%
F	100-168	30-85	8-21	-73% to -75%
G	70	64	117	83%
H	40-157	17-330	22-456	30% to -38%
H	50-72	110-135	0.7-108	-99% to -20%
I	50-157	80-600	12-570	-85% to -5%
J	100-108	52-700	48	-93% to -8%
K	40-80	25-190	20-51	-73% to -20%
L	45-90	200-325	262-428	+31% to +32%
N	N/A	N/A	N/A	N/A
O	64-163	60-70	117	67% to 95%
P	80	65	19	-71%
R	48	90	142	58%
S	N/A	N/A	N/A	N/A

# Other Things You Can Look For

- Tanks + Dehy VOC > 250 tpy ... major source, should have construction permit
- Tanks + Dehy VOC > 100 tpy ... should have Class V Operating Permit
- Tanks + Dehy HAPs > 25 tpy ... NESHAP HH source
- Dehy Benzene > 1 TPY ... NESHAP HH reqmt if in urban area